

Are Substorms that Occur During Magnetic Storm Main Phases Different? If so, how?

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Abstract

We use POLAR global UV imaging data to study nightside auroras during the main-phase of magnetic storms. We will compare and contrast auroras caused by magnetic clouds during solar maximum and by CIRs and HILDCAAs during solar minimum. Our results will show that substorms occurring during storm main-phases, when identifiable, are qualitatively and quantitatively different: they are more intensive and cover a much greater area in both latitude and longitude, i.e., the global particle energy deposition is much greater. The AE index is found to be a poor proxy for energy deposition in such cases, i.e., that the energy may increase nonlinearly with electrojet intensity. There are times when AE and particle precipitation appears to be unrelated. There are also intervals when AE appears to indicate a “substorm” has occurred, but, in reality, there is no evidence of the standard midnight brightening plus poleward expansion occurrence. There are also storm main-phase intervals where it is clear that the precipitation is not ordered by “substorm phenomenology”. Thus the answer to the title is “yes”. Specific comments will be made to address the issue of obtaining much better energy deposition indices.